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PATENT LEGAL STAFF
EASTMAN KODAK COMPANY
343 STATE STREET
ROCHESTER, NY 14650-2201

EXAMINER	
MISLEH, JUSTIN P	

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2612	5

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Please find below and/or attached an Office communication concerning this application or proceeding.

KS

Office Action Summary	Application No.	Applicant(s)	
	09/406,882	BURNS, PETER D.	
	Examiner	Art Unit	
	Justin P Misleh	2612	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 October 2003*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 - 25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *24 and 25* is/are allowed.

6)☒ Claim(s) *1 - 4, 6 - 17, and 19 - 23* is/are rejected.

7)☒ Claim(s) *5 and 18* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *21 October 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed 21 October 2003 have been fully considered but they are not persuasive.

2. First, the Examiner acknowledges and accepts the amendments made to the specification and drawings in the present amendment. There are no further objections to either the drawings or the specification.

3. The Applicant begins formal arguments by reiterating the operation of Yamamoto et al. The Applicant contends that Yamamoto et al. is aimed at use in a digital copier, or printer that receives a digital record from a scanner such as a desktop scanner. The Examiner does not disagree with the Applicant's contention, however; the Examiner takes the position that it makes no difference. The Applicant also contends that Yamamoto et al. describe the acquisition of the digital record using a single one-dimensional sensor array with a pattern of r, g, b filters sequentially arranged along the sensor. Again, the Examiner does not disagree with the Applicant's contention; however, the Examiner believes the Applicant does not give justice to the scope of Yamamoto et al. as a whole.

4. In an attempt to overcome the Examiner's rejection of claims 1, 2, 4, 6 – 9, 12 – 15, 17, and 19 – 22 under 35 U.S.C. § 102(b) as being anticipated by Yamamoto et al., the Applicant has amended independent claims 1 and 14. The Applicant's amendment to claims 1 and 14 further limit the original claims 1 and 14 by changing step (c) of those claims from "processing said at

least one of the digital records with a digital filter" to "processing said at least one of the digital records in two dimensions with a digital filter."

5. The Examiner believes, with regard given to the Applicant's arguments, that the present amendment to claims 1 and 14 is the Applicant's attempt to claim that the digital records are comprised of two "dimensions", for instance a horizontal and a vertical "dimension"; rather than a single horizontal "dimension" as in Yamamoto et al. Regardless of what the Examiner believes the Applicant's intentions are, presently amended claims 1 and 14 do not limit the number of "dimensions" each digital record is comprised of, but rather limit the processing performed on each of the digital records. In the broadest reasonable interpretation of step (c) of presently amended claims 1 and 14, the processor performs processing on the digital records wherein the processing is performed in two "dimensions", or in other words the processing is performed in two steps, or in two stages, etc.

6. To maintain the simplicity of this action, the Examiner traverses the Applicant with regard given to the Applicant's intentions (as stated above) rather than the broadest interpretation (also stated above). Yamamoto et al. teach of several different embodiments with focus primarily around a single one of those embodiments. The primary embodiment of Yamamoto et al. is comprised of the acquisition of a digital color record using a single row color image sensor wherein each color is arranged sequentially along the direction of the row. In the primary embodiment, Yamamoto et al. address color misregistration in a single "dimension" along the direction of the row.

7. In addition, Yamamoto et al. provides several other embodiments in which color misregistration is addressed in two "dimensions." The Examiner directs the Applicant to column

16 (lines 7 – 45) of Yamamoto et al. In other embodiments, the color image sensor is not comprised of solely a single row, rather a plurality of single rows wherein each single row pertains to a particular color. In this embodiment, to completely acquire a digital color record, the image sensor is moved in a direction perpendicular to the direction of the row. Hence, a digital color record is acquired in two "dimensions": the first being along the direction of the row and the second being along the direction perpendicular to the row. Therefore, not only do Yamamoto et al address the color misregistration in a single "dimension" along the direction of the row, but in a second "dimension" along the direction perpendicular to the row.

8. In another embodiment, Yamamoto et al. again uses a single row color image sensor wherein each color aperture along the direction of the row is of a different size. Therefore, in this embodiment, the first "dimension" is the direction along the row and the second "dimension" is the difference in aperture sizes in the direction along the row. Yamamoto et al. again address color misregistration in two "dimensions."

9. As stated above, Yamamoto et al. disclose several embodiments in which the digital color records are in two "dimensions." In addition, the processor of Yamamoto et al. easily performs processing in two "dimensions" (stages, steps, etc.). Therefore, making amendments to claims 1 and 14 as the presented by the Applicant is simply not enough to overcome Yamamoto et al. The Examiner believes that the patentable aspect of the Applicant's invention lies within detecting a feature within the digital color records rather than the "dimensions" of the digital records. More specifically, detecting a feature using elements of the spatial frequency response method for a slanted edge feature according to the ISO 12233 standard is not taught or suggested in the prior art, as elaborated on below.

Claim Rejections - 35 USC § 102

10. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

11. **Claims 1, 2, 4, 6 – 9, 12 – 15, 17, 19 – 22** are rejected under 35 U.S.C. 102(b) as being anticipated by Yamamoto et al.

For the following rejections, please refer to figures 1, 3, and 8 and columns 4 (lines 42 – 56), 5 (lines 14 – 68), 6 (lines 1 – 15 and 65 – 68), 7 (lines 1 – 20 and 47 – 68), 8 (lines 1 – 9), 9 (lines 38 – 68), 10 (lines 1 – 61), 11 (lines 21 – 68), 12 (lines 1 – 65), and 16 (lines 7 – 45). Yamamoto et al. disclose a method in color correction using a digital filter with a phase response that compensates for shifting and an amplitude response for enhancing the sharpness. The Examiner notes that while Yamamoto et al. teach of the same method as the Applicant, the method of Yamamoto et al. is applied differently than that of the Applicant, however, the claims of the Applicant are written broad enough to be clearly read on the method of Yamamoto et al.

12. For **claim 1**, Yamamoto et al. disclose a method of dot sequential error correction, correcting the color misregistration of the multicolor linear image sensor as shown in figure 3. The linear image sensor (104) is comprised of a linear array of photosensitive elements in which each photosensitive element is responsible for detecting a particular wavelength of light (either Red, Green, Blue or Cyan, Magenta, Yellow). Three photosensitive elements comprised of one set of primary colors/complementary colors (either Red, Green, Blue or Cyan, Magenta, Yellow) correspond to one dot (pixel), as shown in figure 3. Since, Yamamoto et al. teach of a

completely digital system including shift registers (201 in figure 1), coefficient registers (202 in figure 1), and multipliers (205 in figure 1), it is inherent that all output from the image sensor (image reader in figure 1) is in digital (please also see figure 8). Therefore, Yamamoto et al. teach color registration correction, which is the correction of the error between color spacing differences in each pixel (approximately 1/3 of each pixel), since each color within the pixel is not in the same position, through the use of a digital filter in which the coefficients for amplitude and phase compensation are predetermined in the exemplary embodiment (figure 1) or through the feature/shift detection of each dot in the present embodiment (figure 8). The image feature detector (4) of figure 8 decides between two separate and different sets of coefficients for the compensation process. The first set of coefficients is determined based upon conventional linear interpolation methods, as stated in column 5, lines 14 – 45. The second set of coefficients is determined based upon the features of neighboring pixels and the shift/spacing differences between each color within a pixel, as stated in columns 5 - 10. The image feature detector resembles an edge detector since it decides upon which set of coefficients to use in compensation based upon the features it detects in the present pixel from the neighboring pixels. For example, as stated in column 12 (lines 24 – 52), when the nearest neighboring pixels have large differences in lightness, hence the present pixel is an edge, the second set of coefficients (shift determination relative to the green color record) are used and when the nearest neighboring pixels are close in lightness, the first set of coefficients are used (similar to conventional linear interpolation). The colors within each pixel will herein be referred to as digital records wherein each digital record is wavelength-dependent (either Red, Green, Blue or Cyan, Magenta, Yellow).

While the above paragraphs give a thorough explanation of primary embodiment Yamamoto et al., the Examiner understands that the Applicant has amended this claim to further specify the "dimensions" of the digital color records. Yamamoto et al. address color misregistration using a digital filter on a plurality of embodiments including the one in the paragraphs directly above and the other embodiments as fully explained in the *Response to Arguments* section of this action (please see above).

Therefore, as stated above, there are three wavelength-dependent digital records per pixel.

Yamamoto et al. disclose, a method for improving the wavelength dependent registration of digital images, said method comprising the steps of:

a. Detecting a similar feature (in image feature detector 4) in two or more digital records (Red, Green, and Blue) of the same original search digital record (one pixel) being wavelength-dependent (The similar feature detected is the edge of the digital records with respect to each other within each pixel and surrounding pixels. Once the similar feature is detected, the image feature detector chooses the second set of coefficients to use for compensation.);

b. Determining from the feature a shift due to misregistration of as least one of the digital records relative to another of the digital records (As stated above, the edge feature is detected for the digital records with respect to each other within each pixel and the neighboring pixels. When an edge is present, the second set of coefficients is used, which are determined from the shifts in the digital records. As shown in figure 3, the

digital records of a pixel are not in the same position as one another, therefore, their misregistration is a shift due to displacement); and

c. Processing (performed in compensation circuit 2) said at least one of the digital records with a digital filter (compensation circuit 2, as shown in detail in figure 1) in two dimensions (as fully explained above) having a phase response that compensates for the shift, thereby providing a correction for the wavelength-dependent misregistration between the digital records (please see column 11, lines 43 – 46, and column 5, lines 61 – 68, and column 6, lines 1 – 15).

2. For **claim 14**, also see claim 1 rejection, Yamamoto et al. disclose, a computer program product for improving the color registration of digital images comprising: a computer readable storage medium having a computer program stored thereon for performing the steps of (Although not explicitly taught, it is inherent that a computer readable storage medium having a computer program stored thereon, since Yamamoto et al. teach of an entirely digital system incapable of operation without microprocessor/CPU instruction driven control):

a. Detecting a similar feature (in image feature detector 4) in two or more digital color records (Red, Green, and Blue) of the same scene (one pixel; The similar feature detected is the edge of the digital records with respect to each other within each pixel and surrounding pixels. Once the similar feature is detected, the image feature detector chooses the second set of coefficients to use for compensation.);

b. Determining from the feature a shift due to misregistration of as least one of the digital color records relative to another of the digital color records (As stated above, the edge feature is detected for the digital records with respect to each other within each pixel

and the neighboring pixels. When an edge is present, the second set of coefficients is used, which are determined from the shifts in the digital records. As shown in figure 3, the digital records of a pixel are not in the same position as one another, therefore, their misregistration is a shift due to displacement); and

c. Processing (performed in compensation circuit 2) said at least one of the digital color records with a digital filter (compensation circuit 2, as shown in detail in figure 1) in two dimensions (as fully explained above) having a phase response that compensates for the shift, thereby providing a correction for the color misregistration between the digital color records (please see column 11, liens 43 – 46, and column 5, lines 61 – 68, and column 6, lines 1 – 15).

2. As for **claims 2 and 15**, Yamamoto et al. disclose, wherein step (a) comprises detecting a graphical element in each of the digital records. Yamamoto et al. teach detecting a similar feature (in image feature detector 4) in two or more digital records (Red, Green, and Blue) of the same original search digital record (one pixel) being wavelength-dependent. The similar feature detected is the edge of the digital records with respect to each other within each pixel and surrounding pixels. Once the similar feature is detected, the image feature detector chooses the second set of coefficients to use for compensation. Therefore, since the shift is due to displacement of the digital records within a pixel within a linear array of pixels, it is detecting a graphical element (shift relative to another digital record) in each of the digital records.

3. As for **claims 4 and 17**, Yamamoto et al. disclose, wherein step (a) comprises detecting an edge feature in each of the digital records. The image feature detector resembles an edge detector since it decides upon which set of coefficients to use in compensation based upon the

features it detects in the present pixel from the neighboring pixels. For example, as stated in column 12 (lines 24 – 52), when the nearest neighboring pixels have large differences in lightness, hence an edge in the present pixel, the second set of coefficients (shift determination relative to the green color record) are used and when the nearest neighboring pixels are close in lightness, the first set of coefficients are used (similar to conventional linear interpolation).

4. As for **claims 6 and 19**, Yamamoto et al. disclose, as stated in columns 11 (lines 67 and 68) and 12 (lines 1 – 11) wherein step (b) comprises computing a difference in pixel location of the feature located in said at least one digital record relative to the same feature located in said another of the digital records. The image feature detector detects the edge feature in the present digital record from the lightness in the surrounding digital records. Once an edge is detected in the present digital record, a reference digital record is chosen (Green) and the pixel differences/correction coefficients are calculated.

5. As for **claims 7 and 20**, Yamamoto et al. disclose, wherein step (c) comprises processing the digital records with a FIR filter having an asymmetric response represented by a set of coefficients (see table 1 in column 6). Although Yamamoto et al. do not explicitly disclose a FIR filter; it is inherent that a FIR filter is used since the digital filter is used for phase compensation. IIR filters distort the phase of the signal by not delaying the input signal, therefore rendering the method of Yamamoto et al. in operable.

6. As for **claims 8 and 21**, Yamamoto et al. disclose, wherein step (c) comprises using a set of precalculated coefficients selected from a plurality of sets precalculated coefficients for various pixel shifts. As stated above, Yamamoto et al. teach color registration correction through the use of a digital filter in which the coefficients for amplitude and phase compensation are

predetermined. The image feature detector (4) of figure 8 decides between two separate and different sets of coefficients for the compensation process. The first set of coefficients is determined based upon the shift/spacing differences between each color within a pixel. The second set of coefficients is determined based upon the features of neighboring pixels. The image feature detector decides upon which set of coefficients to use in compensation based upon the features it detects in neighboring pixels.

7. As for **claims 9 and 22**, Yamamoto et al. disclose, wherein step (c) comprises processing said at least one of the digital records with digital filter having a magnitude response that compensates for and aspect of the digital recorded other than misresgistration. It is inherent that the coefficients used for compensation from the digital filter with a magnitude (amplitude) response and a phase response. The phase response inherently shifts the digital records while the magnitude response inherently brightens the digital records. Yamamoto et al. explicitly teach the design of the filter coefficients to compensate for phase and resolution errors (see columns 5, lines 61 – 68, and 6, lines 1 – 15).

8. As for **claim 12**, Yamamoto et al. disclose, a method as claimed in claim 1 wherein the digital records are red, green, and blue records (see figure 1).

9. As for **claim 13**, Yamamoto et al. disclose, as stated in columns 5 (lines 46 – 68) and 6 (lines 1 – 64), a method as claimed in claim 12 wherein said another of the records in step (b) is the green color record and the red and blue color records are filtered in step (c) to correct for color misregistration between the red and blue color records and the green color record. As shown with equation set 2 in column 5 and as stated in column 9 (lines 37 – 61), the similar feature detected is the shift of the digital records with respect to each other, including a green

color record as the reference, within each pixel. As shown in figure 3, the digital records of a pixel are not in the same position as one another,. therefore, their displacement is a shift due to misregistration and the filtering for compensation is provided for the color records, including red and blue.

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

11. **Claims 3 and 16** are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto et al. in view of Herman et al.

12. For **claims 3 and 16**, Yamamoto et al. disclose a method of dot sequential error correction, correcting the color misregistration of the multicolor linear image sensor as shown in figure 3. Yamamoto et al. teach color registration correction, which is the correction of the error between color spacing differences in each pixel (approximately 1/3 of each pixel), since each color within the pixel is not in the same position, through the use of a digital filter in which the coefficients for amplitude and phase compensation are predetermined in the exemplary embodiment (figure 1) or through the feature/shift detection of each dot in the present embodiment (figure 8). Yamamoto et al. disclose, detecting a graphical element in each of the digital records. However, Yamamoto et al. do not disclose computing a centroid of the graphical element. Herman et al. also disclose an image registration system. However, Herman et al.

teach of the image registration/alignment of frames of color mosaics. As stated in column 22 (lines 31 – 65) and as shown in figures 7 and 15, to align the mosaic images with one another Herman et al. computes a centroid for a graphical element in each image. As stated in column 22 (lines 58 – 60), at the time the invention was made, one with ordinary skill in the art would have been motivated to compute the centroid of a graphical element in an image as taught by Herman et al. in the color registration system with graphical element detection of Yamamoto et al. as means to minimize distortion of the images to be aligned at the edges after alignment. Therefore, it would have been obvious to one with ordinary skill in the art to have computed the centroid of a graphical element in an image as taught by Herman et al. in the color registration system with graphical element detection of Yamamoto et al.

13. **Claims 10, 11, and 23** are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto et al.

14. For **claims 10 and 23**, Yamamoto et al. disclose processing at least one of the digital color records with a digital filter having a phase response that compensates for the shift and a magnitude response that compensates for an aspect of the digital recorded other than misregistration. Yamamoto et al. do not disclose wherein the digital filter is obtained by convolving a first digital filter having a phase response that compensates for the shift with a second digital filter having a magnitude response that compensates for an aspect of the digital records other than shift. Although, Yamamoto et al. disclose a single digital filter having both a magnitude and phase response responsible for compensating for resolution and shift, respectively, one with ordinary skill in the art would have been motivated to include two digital filters, convolving the first, which compensates for shift, with the second, which compensates for

resolution as a means to provide two separate filters in which when applied with the same correction coefficients can focus explicitly on correcting shift and resolution, independently and respectively. Therefore, at the time the invention was made, it would have been obvious to one with ordinary skill in the art to have included two digital filters, convolving the first, which compensates for shift, with the second, which compensates for resolution.

15. As for **claim 11**, Yamamoto et al. do not disclose, as stated above, two digital filters, however it would have been obvious to do so. Yamamoto et al. disclose a digital filter, which compensates for resolution and shift (see column 5, lines 61 – 68). Therefore, Yamamoto et al. disclose wherein the second digital filter enhances the sharpness (resolution) of one or more of the digital records.

Allowable Subject Matter

16. **Claims 5 and 18** objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

13. **Claims 24 and 25** are allowed.

14. The following is a statement of reasons for the indication of allowable subject matter: prior art does not teach or fairly suggest detecting similar features in wavelength-dependent digital records using elements of the spatial frequency response method for a slanted edge feature according to the ISO 12233 standard.

Conclusion

15. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Justin P Misleh whose telephone number is 703.305.8090. The examiner can normally be reached on Monday - Thursdays from 7:30 am to 5:30 pm and alternating Fridays from 7:30 am to 4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wendy R Garber can be reached on 703.305.4929. The fax phone numbers for the organization where this application or proceeding is assigned are 703.872.9314 for regular communications and 703.872.9314 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Technology Center 2600 Customer Service Office whose telephone number is 703.306.0377.

JPM
November 8, 2003

WENDY R. GARBER
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600